

CHECK LIST OF GASTROTRICHS FROM THE CANARY ISLANDS

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ABSTRACT

A total of 11 gastrotrich species have been so far recorded from the Canary archipelago. The two orders of the phylum are represented in Islands, with six macrodasyidans and five chaetonotidans species. This short check-list indicates that in the Canary archipelago fauna belonging to this interstitial group is still scarcely known; it is forecasted that future sampling campaigns especially focused on subtidal sandy seabeds shall provide many more records, and even new species of this taxonomic group.

Key words: Gastrotricha, interstitial, benthos, marine, caves, Canary Islands, Atlantic Ocean.

RESUMEN

En la actualidad se han citado un total de 11 especies de gastrotrícos en el archipiélago canario. Los dos subórdenes de gastrotrícos se encuentran representados en las islas Canarias, con 6 especies de macrodásidos y 5 especies de quetonótidos. Este listado preliminar muestra la escasa información existente en la actualidad sobre este grupo intersticial. Futuras campañas de muestreo enfocadas al estudio de los fondos arenosos submareales de Canarias proporcionarán nuevos registros e incluso nuevas especies anteriormente no descritas de este grupo de organismos.

Palabras clave: Gastrotricha, intersticial, bentos, marino, cuevas, islas Canarias, Océano Atlántico.

INTRODUCTION

Currently, gastrotrichs include *ca.* 780 species of small aquatic metazoans, about half of which are marine (TODARO *et al.* [28]). Gastrotrichs are a common component of meiofauna assemblages, and may be the dominant group in selected intertidal beaches (DELGADO *et al.* [4]; HOCHBERG [7]). In general, gastrotrich populations rank third in

abundance in marine systems following the nematodes and the harpacticoids copepods while in freshwater ecosystems, gastrotrichs are considered among the most abundant invertebrates (STRAYER *et al.* [20]). Nowadays, Gastrotricha is considered a phylum (HUMMON & TODARO [12]) though several authors consider them included within Aschelminthes (e.g. RUPPERT [19]). Recent phylogenetic studies place gastrotrichs within Platyzoa (DUNN *et al.* [5]; HEJNOL *et al.* [6]).

Gastrotrichs feeds mainly on bacteria, algae, protozoans and detritus; together with their high rates of population turnover it has been suggested that they may have a considerable influence on the composition of natural bacteria communities in freshwater and marine environments (STRAYER *et al.* [20]).

In recent years, an important number of records and unpreviously described species of this group have been discovered from marine caves (e.g. TODARO *et al.* [30]). Sciaphilous environments and relatively deep sand sediment (< -10 m water depth) seem to be a suitable habitat for gastrotrich species and recent sampling campaigns in the Canary archipelago seem to corroborate such idea. In the present check-list, eleven gastrotrich species are cited from several faunistic studies carried out in the Canary archipelago, with special emphasis on the biodiversity study of the surroundings of the lava tube system of "Jameos del Agua" (Lanzarote).

MATERIAL AND METHODS

The species reported here for the first time from the archipelago, were found in sublittoral samples collected at 18-45 m water depth, in fine-medium sands with some detritus collected at Mala, on southeast side of Lanzarote (Lat. 29°5' 0.53"N; Long. 13°26' 59.09"W). About 1 litre of sediment was collected by scuba divers by means of plastic jars and soon after taken to the field laboratory (Aula de Naturaleza de Magua, Lanzarote) and processed within one week; specimens were extracted daily by the narcotization-decantation technique using a 7% magnesium chloride solution. The supernatant was poured into plastic Petri dishes (3 cm diameter) and scanned for gastrotrichs at 40x under a Wild M5 stereomicroscope. When located, gastrotrichs were mounted on glass slides, and observed *in vivo* with Nomarski differential interference contrast optics using a Leitz Dialux 20 microscope equipped with a DS-5 M Nikon digital camera. During the observation, animals were measured with the Nikon NIS F software (see TODARO & HUMMON [27]). A number of worms were stored in 95% ethanol for later DNA. Measurements were derived from photomicrographs. Terminology and the abbreviations used follow TODARO [22].

SYSTEMATICS

PHYLUM GASTROTRICHA Metschnikoff, 1865
Order Macrodasysida Remane, 1925

Family Cephalodasyidae Hummon & Todaro, 2010
Genus *Megadasys* Schmidt, 1974

Megadasys sterreri (Boaden, 1974)

Studied material.- 4 specimens, attaining a maximum total length of 3,280 μm .

Distribution and accompanying data.- Atlantic-Mediterranean species (BOADEN [3]; REISE & AX [17]). This species has been recorded in oxygen-reduced environments in subtidal sandy seabeds (REISE & AX [17]), with adaptations to avoid oxic sediment surface layer. *Megadasys sterreri* has been indicated as a meiofaunal organism with a thiobiotic ability (MAGUIRE & BOADEN [15]).

Genus *Mesodasys* Remane, 1951

Mesodasys laticaudatus Remane, 1951

Studied material.- 3 specimens, attaining a maximum total length of 935.3 μm .

Distribution and accompanying data.- Atlantic-Mediterranean species (HUMMON & WARWICK [13]; TODARO [21]). This species has been generally found in medium or coarse sands mixed with biodebris, or even in fine shell gravels on subtidal seabeds (TODARO *et al.* [24]).

Family Planodasyidae Rao & Clausen, 1970
Genus *Crasiella* Clausen, 1968

Crasiella sp.

Studied material.- 8 specimens, attaining a maximum total length of 511.5 μm .

Distribution and accompanying data.- Seven species have been so far described of the genus *Crasiella*, one of them, *Crasiella azorensis* Hummon, 2008, has been collected in the Macaronesian region, in intertidal sediments of a beach in Faial (Azores) (HUMMON [9]). In the Canary archipelago a *Crasiella* similar to the specimens found in Lazarote has been reported also from Candelaria, a coastal locality on the north-east coast of Tenerife (TODARO *et al.* [23]).

Family *Thaumastodermatidae* Remane, 1927
Subfamily *Thaumastodermatinae* Remane, 1927
Genus *Tetranchyroderma* Remane, 1926

Studied material.- Data from recent literature.

Distribution and accompanying data.- The type locality of this species is a subtidal seabed off-shore Candelaria, a coastal locality on the north-east coast of Tenerife (TODARO *et al.* [23]). Sediments were dominated by black volcanic sands with a grain size ranging from 0.105-0.125 mm diameter. Meiofaunal community was dominated by nematodes (72.30%) and crustaceans, mainly harpacticoid copepods (11.62%) (TODARO *et al.* [23]).

Genus *Oregodasys* Hummon, 2008

Oregodasys cirratus Rothe & Schmidt-Rhaesa, 2010

Studied material.- Data from recent literature.

Distribution and accompanying data.- The type locality of this species was a subtidal seabed (30 m depth) in front of the submarine cave system "Cueva de los Cerebros", on the western coast of Tenerife (Playa San Juan). The sediment composition was dominated by volcanic and shell gravels (ROTHER & SCHMIDT-RHAESA [18]).

Family *Turbanellidae* Remane, 1926
Genus *Paraturbanella* Remane, 1927

Paraturbanella teissieri Swedmark, 1954

Studied material.- Data from recent literature.

Distribution and accompanying data.- Amphiatlantic, recorded in the North Sea, United Kingdom, Mediterranean Sea and Gulf of Mexico (e.g., HUMMON & WARWICK [13], TODARO *et al.* [14, 25]). This species shows preference for well-oxygenated sands, being most abundant in medium-size sediments of subtidal sandy seabeds (TODARO *et al.* [24]). In the Canary archipelago it has been reported from Candelaria, a coastal locality on the north-east coast of Tenerife (TODARO *et al.* [23]).

Order *Chaetonotida* Remane, 1925
Suborder *Paucitubulatina* d'Hondt, 1971
Family *Chaetonotidae* Gosse, 1864
Subfamily *Chaetonotidae* Kisielewski, 1991
Genus *Aspidiophorus* Voigt, 1903

Aspidiophorus paramediterraneus Hummon, 1974

Studied material.- 2 specimens attaining a maximum total length of 285.3 μm .

Distribution and accompanying data.- Amphiatlantic (HUMMON [18]; TODARO & ROCHA [32]). Mediterranean Sea (BALSAMO *et al.* [1]). This species has been recorded in subtidal seabeds dominated by fine to coarse sands (TODARO & ROCHA [32]).

Genus *Chaetonotus* Ehrenberg, 1830

Chaetonotus apechochaetus Hummon, Balsamo & Todaro, 1992

Studied material.- 1 specimen attaining a maximum total length of 138.2 μm .

Distribution and accompanying data.- Amphiatlantic. This species was originally described from sublittoral fine sands of the western coast of Italy (HUMMON *et al.* [11]) it has been reported also from Brazil where it is sparse in littoral medium sands along the coast of the state of Sao Paulo (TODARO & ROCHA [32]).

Chaetonotus lacunosus Mock, 1979

Studied material.- 2 specimens attaining a maximum total length of 134.3 μm .

Distribution and accompanying data.- Atlantic-Mediterranean area (MOCK [16]; HUMMON *et al.* [11]). This species has been recorded in subtidal seabeds in fine to coarse sands at 8 m depth (HUMMON *et al.* [11]).

Genus *Halichaetonotus* Remane, 1936

Halichaetonotus aculifer (Gerlach, 1953)

Studied material.- 4 specimens attaining a maximum total length of 155.8 μm .

Distribution and accompanying data.- Amphiatlantic (JOUK *et al.* [14]; TODARO *et al.* [26]). Mediterranean Sea (BALSAMO *et al.* [2]). This gastrotrich has been recorded in shallow subtidal seabeds (1-4 m depth) (BALSAMO *et al.* [2]).

Genus *Heterolepidoderma* Remane, 1927

Heterolepidoderma loricaatum Schrom, 1972

Studied material.- 3 specimens attaining a maximum total length of 105.8 μm .

Distribution and accompanying data.- Amphiatlantic described from the Adriatic sea it has subsequently found in several beaches of the Mediterranean (TODARO *et al.* [29]) and also along the US shores of the in the Gulf of Mexico (TODARO *et al.* [26]). In Italy this species has been widely recorded in shallow subtidal sandy seabeds at 1-4 m depth (BALSAMO *et al.* [2]).

DISCUSSION

A total of 11 gastrotrich species have been so far recorded from the Canary archipelago; this appears as good number knowing that from the continental Spain only one species has been reported in written so far i.e., *Turbanella cornuta* Remane 1925. However, the richness of the gastrotrich fauna reported from regions that have been investigated to a better extent (e.g. Italy, about 180 species, from some 180 localities; Greece: 44 sampled localities, 77 recorded species; France: 37 sampled localities, 70 recorded species) indicated that a much rich fauna may be discover in the Canary islands, if additional localities are investigated. This easy forecast is based also on the consideration that in a preliminary work TODARO *et al.* [31] indicated in over 70 species the composition of the gastrotrich fauna inhabiting 10 locations along the Spanish coast of the Alborán Sea and adjacent areas.

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REFERENCES

- [1] BALSAMO, M., M. A. TODARO & P. TONGIORGI. 1992. Marine gastrotrichs from the Tuscan archipelago (Tyrrhenian Sea): II Chaetonotida, with description of three new species. *Bolletino di Zoologia*, 59: 487-498.
- [2] BALSAMO, M., E. FREGNI & P. TONGIORGI. 1996. Marine gastrotricha from Sicily with the description of a new species of *Chaetonotus*. *Italian Journal of Zoology*, 63: 173-183.
- [3] BOADEN, P.J.S. 1974. Three new thioibiotic Gastrotricha. *Cahiers de Biologie Marine*, 15(3). 267-378.
- [4] DELGADO, J.D., J. NÚÑEZ, R. RIERA & Ó. MONTERROSO. 2003. Abundance and diversity patterns of meiofaunal annelids from intertidal areas in Iceland. *Hydrobiologia*, 496: 311-319.
- [5] DUNN C.W., A. HEJNOL, D.Q. MATUS, K. PANG, W.E. BROWNE, S.A. SMITH, E. SEAVER, G.W. ROUSE, M. OBST, G.D. EDGEcombe, M.V. SORENSSEN, S.H.D. HADDOCK, A. SCHMIDT-RHAESA, R.M. KRISTENSEN, W.C. WHEELER, M.Q. MARTINDALE & G. GIRIBET. 2008. Broad phylogenomic sampling improves resolution of the animal tree of life. *Nature*, 452, 745-749.
- [6] HEJNOL, A., M. OBST, A. STAMATAKIS, M. OTT, G.W. ROUSE, G.D. EDGEcombe, P. MARTÍNEZ, J. BAGUNA, X. BAILLY, U. JONDELIUS, M. WIENS, W.E.G. MÜLLER, E. SEAVER, W.C. WHEELER, M.Q. MARTINDALE, G. GIRIBET & C.W. DUNN. 2009. Assessing the roots of bilaterian animals with scalable phylogenomic methods. *Proceedings of the Royal Society B*, 276, 4261-4270.
- [7] HOCHBERG, R. 1999. Spatiotemporal size-class distribution of *Turbanella mustela* (Gastrotricha: Macrodasyida) on a northern California beach and its effect on tidal suspension. *Pacific Science*, 53: 90-100.

- [8] HUMMON, W.D. 1974. Gastrotricha from Beaufort, North Carolina, USA. *Cahiers de Biologie Marine*, 15: 431-446.
- [9] HUMMON, W.D. 2008. Gastrotrich of the North Atlantic Ocean: I. Twenty four new and two undescribed species of Macrodasys. *Meiofauna Marina*, 16: 117-174.
- [10] HUMMON, W.D. 2011. Marine gastrotricha of the near East. I. Fourteen new species of Macrodasys and a redescription of *Dactylopoda agadasys* Hochberg, 2003. *Zookeys*, 94: 1-59.
- [11] HUMMON, W.D., M. BALSAMO & A. TODARO. 1992. Italian marine Gastrotricha: I. Six new and one redescribed species of Chaetonotida. *Bolletino di Zoologia*, 59: 499-516.
- [12] HUMMON, W.D. & A. TODARO. 2010. Analytic taxonomy and notes on marine, brackish-water and estuarine Gastrotricha. *Zootaxa* 2392: 1-32.
- [13] HUMMON, W.D. & R.M. WARWICK. 1990. The marine flora and fauna of the Isles of Scilly - Gastrotricha. *Journal of Natural History*, 24: 519-525.
- [14] JOUK, P.E.H., W.D. HUMMON, M.R. HUMMON & E. ROIDOU. 1992. Marine Gastrotricha from the Belgian coast: species list and distribution. *Bulletin de l'Institut Royal des Sciences Naturelles de Belgique, Biologie*, 62: 87-90.
- [15] MAGUIRE, C. & P.J.S BOADEN. 1975. Energy and evolution in the thioobios. An extrapolation from the marine gastrotrich *Thiodasys sterreri*. *Cahiers de Biologie Marine*, 16: 635-646.
- [16] MOCK, H. 1979. Chaetonotoidea (Gastrotricha) der Nordseeinsel Sylt. *Mikrofauna Meeresbodens*, 18: 1-107.
- [17] REISE, K. & P. AX. 1979. A meiofaunal "Thioobios" limited to the anaerobic sulfide system of marine sand does not exist. *Marine Biology*, 54: 225-237.
- [18] ROTHE, B.H. & A SCHMIDT-RHAESA. 2010. *Oregodasys cirratus*, a new species of Gastrotricha (Macrodasys) from Tenerife (Canary Islands), with a description of the muscular and nervous system. *Meiofauna Marina*, 18: 49-66.
- [19] RUPPERT, E.E. 1991. Gastrotricha. In: Harrison, F.W. & E.E. Ruppert (eds.). *Microscopic Anatomy of Invertebrates*, vol. 4, Aschelminthes. New York, 41-109.
- [20] STRAYER, D.L., W.D. HUMMON & R. HOCHBERG. 2010. Chapter 7: Gastrotricha. Ecology and Classification of North American Freshwater Invertebrates, 163-172. In THOR, J.H & A.P. COVICH (eds). *Ecology and classification of North American freshwater invertebrates*, 2nd ed., xvi + 1056 pp. Academic Press, San Diego, CA.
- [21] TODARO, M. A. 1992. Contribution to the study of the Mediterranean meiofauna: marine Gastrotricha from Ponza Island. *Bolletino di Zoologia*, 59: 321-333.
- [22] TODARO, M.A. 2002. An interesting new gastrotrich from litoral meiobenthos (Long Beach Islands, USA), with a key to species of *Tetranchyroderma* (Gastrotricha. Macrodasys). *Journal of Marine Biological Association of United of Kingdom*, 82(4): 555-563.
- [23] TODARO, A., P. ANCONA. A. MARZANO, M. GALLO D'ADDABBO & S. DE ZIO GRIMALDI. 2003. A new *Tetranchyroderma* species (Gastrotricha, Macrodasys, Thaumastodermatidae) from the Canary Islands (Spain). *Cahiers de Biologie Marine*, 44: 191-197.
- [24] TODARO, A., M. BALSAMO & P. TONGIORGI. 1992. Marine gastrotrichs from the Tuscan Archipelago (Tyrrhenian Sea): I. Macrodasys, with description of three new species. *Bolletino di Zoologia*, 59: 471-485.

- [25] TODARO, A., M. DAL ZOTTO, U. JONDELIUS, R. HOCHBERG, W.D. HUMMON, T. KANNEBY & C.E. ROCHA. 2012. Gastrotricha: a marine sister for a freshwater puzzle. *PLoS ONE*, 7(2): 1-11.
- [26] TODARO, A., J.W. FLEEGER & W.D. HUMMON. 1995. Marine gastrotrichs from the sand beaches of the northern Gulf of Mexico: species list and distribution. *Hydrobiologia*, 310: 107-117.
- [27] TODARO, M.A. & W.D. HUMMON 2008. An overview and a dichotomous key to genera of the phylum Gastrotricha. *Meiofauna Marina*, 16: 3-20.
- [28] TODARO, A., T. KANNEBY, M. DEL ZOTTO & U. JONDELIUS. 2011. Phylogeny of Thaumastodermatidae (Gastrotricha: Macrodasysida) inferred from nuclear and mitochondrial sequence data. *PLoS ONE*, 6(3): 1-13.
- [29] TODARO, M.A., L. MATINATI, M. BALSAMO & P. TONGIORGI. 2003. Faunistics and zoogeographical overview of the Mediterranean and Black Sea marine Gastrotricha. *Biogeographia*, 24, 131-160
- [30] TODARO, A., F. LEASI, N. BIZZARRI & P. TONGIORGI. 2006. Meiofauna densities and gastrotrich community composition in a Mediterranean sea cave. *Marine Biology*, 149: 1079-1091.
- [31] TODARO, M.A., F. LEASI & P. TONGIORGI. 2006. I Gastrotrichi del Mare di Alboran. *Atti 67° Congresso Nazionale dell'Unione Zoologica Italiana*. Napoli, 12-15 settembre 2006.
- [32] TODARO, A. & C.E. ROCHA. 2004. Diversity and distribution of marine Gastrotricha along the northern beaches of the State of Sao Paulo (Brazil), with description of a new species of *Macrodasys* (Macrodasysida, Macrodasysidae). *Journal of Natural History*, 38: 1605-1634.